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Funding Source: College of Engineering Undergraduate Research Option

## **3D finite element analysis of the acetabulum and interference fit for total hip arthroplasty**

Joseph Middleton & Douglas Smith

Demand for hip replacement surgery is rising with the increasing age of the human population. The effects of the cementless interference fit acetabular cups are not fully understood, and as such is the focus of the present research. The inserted cup being 2 mm larger in diameter than the reamed hip induces significant stresses upon the surrounding bone. The magnitude of the induced stresses within the hip impact the ingrowth of bone into the fixture. Therefore a complete understanding of these induced stresses from various implant designs will allow an analysis to be made to increase the useful part life preventing revision surgery. A full three dimensional finite element analysis is performed upon several different hip geometries constructed from CT scans and analyzed using various commercially available software packages (Amira, Rhinoceros, ProEngineer, Hypermesh, ABAQUS). The present study includes 5 different hips, each of which will be analyzed for the insertion of 3 different acetabular cup designs.